30.72
1968
.11

MOSCOW, MARCH, 1939 EXTENSION BULLETIN NO. 110

UNIVERSITY OF IDAHO
COLLEGE OF AGRICULTURE

EXTENSION DIVISION

E. J. IDDINGS
DIRECTOR

First Year Canning

By
MARION HEPWORTH
AND
W. V. HALVERSEN

COOPERATIVE EXTENSION SERVICE IN AGRICULTURE AND HOME ECONOMICS
OF THE STATE OF IDAHO, UNIVERSITY OF IDAHO COLLEGE OF
AGRICULTURE AND UNITED STATES DEPARTMENT
OF AGRICULTURE COOPERATING

BOYS' AND GIRLS' CLUBS

Printed and distributed in furtherance of the purposes of the Cooperative Agricultural Extension Service provided for in Act of Congress May 3, 1914.

First Year Canning Requirements

For Completion

12 quarts of fruit
10 quarts of vegetables

For Exhibits

5 varieties of fruit
3 varieties of vegetables

First Year Canning

Successful Canning

CANNING has been defined as the preservation of foods in hermetically sealed containers, the preservation being accomplished by heat. The heat cooks the raw material, destroys or renders inactive the organisms and enzymes and creates a vacuum in the container which causes a hermetic seal.

There are several methods of food preservation based on the principles of preventing the growth of micro-organisms. Heat is used to kill them; freezing is used to prevent them from growing; drying removes the moisture necessary for them to grow; adding sugar, salt and pickling preserves foods by increasing the concentration; chemicals such as benzoate of soda, and even spices and oils are sometimes used, but generally substances poisonous to bacteria are poisonous to man because their digestive processes are similar. This discussion, however, is limited to heat.

The Cause and Nature of Food Spoilage

Spoilage of perishable foods is caused by molds, yeasts, bacteria and enzymes. The first three of these groups are living organisms and the process of canning is merely a procedure designed to kill them or produce conditions which will prevent them from growing and at the same time effectively seal the food so that others cannot gain admission. Enzymes are chemical substances found in all living matter. They cause food to ripen, green peas to lose their sugar and become hard. They assist the living animal to digest its food. Raw fruits and vegetables deteriorate very quickly because of these naturally occurring enzymes. Fortunately, boiling for a few minutes (blanching) destroys them.

The deterioration of fresh fruits and vegetables before processing by heat is due primarily to enzymes, while the spoilage which occurs in the jar or can after processing is always due to the growth of molds, yeasts, or bacteria.

Generally speaking, molds and yeasts cause the spoilage of acid fruits and pickles, whereas bacteria generally are responsible for the spoilage which occurs in low-acid or non-acid vegetables and meats. Since yeasts are killed at a temperature of 150° F. and molds will not develop in air-tight containers, there should be little excuse for spoilage in home canned acid fruits, provided reasonable care is taken. Bacteria as a group are the canner's biggest problem because they are much more resistant to heat than are yeasts and molds. They are killed readily in highly acid foods, but in the low-acid or non-acid foods, some bacterial spores can withstand the action of boiling water for many hours. Since these bacteria are ever present in nature, the canner must always assume that they are present on the raw material and in the container.

The nature of spoilage, or, in other words, just what happens to a food when it does spoil, is an interesting subject. Cheeses, sauerkraut, buttermilk, dill pickles, etc., are prepared by the same process which would be called spoilage if it took place in canned foods. Molds produce a fuzzy-like growth. A heavy growth of mold will affect the taste, flavor, and texture to the extent that the food must be discarded. However, small mold growth may be removed and the food eaten with safety. Yeasts cause fermentation of fruits with the production of gas. This causes the tin can to swell or the glass container to break or its seal to open. Such foods should be destroyed. Bacteria attack low-acid or non-acid foods. They may produce gases, acids, turbidity, odors or flavors or toxins (poisons). Any non-acid food showing spoilage should be destroyed. Sometimes spoilage cannot be detected, hence all home canned vegetables should be boiled in an open container before serving. The heat breaks down the poisonous compounds that may have developed in the jar.

Low or Non-Acid Foods—Vegetables and Meat

Non-acid or low-acid foods are subject to the growth of almost every kind of bacteria, yeasts, and molds. Since certain bacteria produce heat resistant spores, among them the well known food-poisoning organism, *Clostridium botulinum,* it becomes necessary to employ a more drastic method of processing. It is necessary that this class of foods be processed in a steam pressure cooker at a temperature of 240° to 250° F., by using 10 to 15 pounds of steam pressure. Non-acid foods include all vegetables except tomatoes and pickled beets.

Acid Foods—Fruits, including Tomatoes

In canning fruits, the open kettle method, the oven method, the hot water bath canner or wash boiler may all be used successfully, providing there is the usual care and precaution in the selection and preparation of the fruit beforehand.

The oven method will require a little longer time than the hot water bath. For evample, peaches packed hot require 15 minutes processing in the water bath, and in the oven require 25 minutes. In the open kettle method and the oven method, complete sterilization of jars and caps is necessary.

Tin cans should not be used in canning fruits or tomatoes by the open kettle method.

Prepare for the canning season by checking over in advance the equipment and materials that will be needed. This may prevent delays when the food is ready to can.

Successful canning requires a knowledge of how to destroy the micro-organisms and leave the food in the most palatable condition. Fruits belong to a class of foods which are sour or acid. They have very characteristic flavors and aromas due to certain volatile acids. Since heat impairs these flavors, it is desirable to apply the least heat possible that will destroy the spoilage organisms.

Steps in Canning

Safe canning requires careful attention to every step in the process from the selection of the raw food to the final check-up of the canned products during storage. The following list gives the steps in order:

1. Select good materials. The quality of canned products can be no higher than the quality of the raw food that goes into the can. Use only clean, fresh, sound foods in prime condition, and be sure that the containers in which they are handled are clean. Any unnecessary infection of the raw food increases the difficulty of processing and the liability of spoilage of the canned products.

With fruits and vegetables, grade for size and the same degree of ripeness if a uniform product is desired. Wash thoroughly until every trace of soil is removed. The most dangerous bacteria and those most difficult to kill are in the soil. A wire basket is a help in washing, but should not be loaded too heavily. Always lift the fruit and vegetables out of the water rather than pour the water off.

2. Prepare jars or cans. Follow the directions for glass jars and for tin cans.

3. Syrup. Make the syrup for fruits in advance so there will be no delay when it is required.

4. Precooking. Some foods are precooked for a short time before they are packed into the containers. This precooking helps to remove air from the tissues, shrinks them, facilitates packing, and speeds up the processing because the foods are already hot when they are placed in the cooker.

5. Packing. When using glass jars, remove one jar at a time from the hot-water bath where it has been held. Keeping the jars hot helps to prevent breakage during packing and processing. If needed, place a new wet rubber ring in position resting flat on the sealing shoulder of the jar.

Pack the containers quickly so that the precooked food remains hot. Use a sufficient proportion of liquid to solids to prevent too dense a pack, and work out the air bubbles with a knife blade or spatula.

Leave the proper headspace in the containers.

6. Exhausting and adjusting covers. Food in glass jars is exhausted, or the air partially removed during processing, because the jars are not fully sealed. As each glass jar is packed, carefully wipe off the rubber ring to remove any particles of food, and adjust the cap to seal the jar partially and permit exhausting. Place the jars as finished in the canner or where they will keep hot until processing begins.

Tin cans packed with precooked food should be sealed at once, while the food is steaming hot, and placed in the cooker. If the food has not been precooked before packing, it should be exhausted. Seal the cans at once after exhausting.

7. Processing. Process at the temperature and for the time indicated in the time-tables given.

8. Cooling. Cool glass jars in air but protect them from drafts. After they are cool, invert, and observe for leakage. Do not attempt to tighten screw caps or screw bands after the jars have cooled.

Cool tin cans in cold water, using running water if possible.

9. Re-processing. If any containers show signs of leakage, they should be opened, the contents heated and re-packed in other containers, and processed again as at first.

10. Labeling. Wipe the containers clean and label with the name, the date, and the lot number, if more than one lot was canned on that day. Glass jars may be labeled with a pencil that writes on glass, with gummed labels, or with adhesive tape. Use rubber cement to fix paper labels on tin, or if the labels are long enough, put glue along one end, wrap smoothly around the can, and lap the glued end over the other. Or tin cans may be marked with a glass pencil, rubber stamp, or canners' ink.

11. Checking up results. Hold canned products at room temperature for a week or ten days where they can be examined from time to time to be sure that they are keeping. If any show signs of spoilage, examine all of that lot carefully.

12. Storage. Store canned foods in a cool, dry place, and protect glass jars from the light so that the food will not fade in color. Canned foods, if properly processed, will keep almost indefinitely under the right conditions. However, the quality is generally better if they are used within the first year after canning.

Preparation of Jars for Use, etc.

Preparing glass jars for use. Examine glass jars and caps before using to make certain they are in good condition. Discard any jars or caps showing cracks, chips, or dents, and any caps with loose linings. Tighten loose wire clamps on the jars.

Wash the jars, also zinc and glass caps, in soapy water, and rinse. Place them in a pan of warm water with a rack or cloth in the bottom to prevent bumping. Bring to the boiling point and keep hot until required. Jars for open kettle canning should be sterilized by 15 to 20 minutes boiling. When jars are packed with food and then processed they do not need to be sterilized first, but they should be clean and hot when filled. Prepare jar caps that have a sealing composition by pouring boiling water over them and allowing them to stand until used. Dip rubber rings into boiling water, adjusting on the jars.

Head Space. When food is processed in glass jars, a head space is left at the top to permit expansion of the food. Head space is measured from a straight edge laid across the top of the jar. Allow one-half inch of head space in all jars except those containing starchy foods (corn, peas); they require one inch because of greater expansion. The solid material in jars should be covered by liquid—water, syrup, or broth, as the case may be.

Exhausting and cooling glass jars. All types of glass jars can be adjusted to allow the exhausting, or passing out, of air from the food during processing.

With the mason jar, the cap is screwed on until it is tight and then turned back ¼ inch. After processing, the cap is screwed down as tightly as possible. With the "lightning-type" modified mason the top clamp is snapped into place and the side clamp left up. After processing, the side clamp is pushed down. In both jars the actual seal is formed by the pull of the partial vacuum in the jar during cooling. Hence, it is better if these jars are cooled in an upright position.

With the vacuum or self-sealing jars, no special adjustment is used for exhausting the air. The screw bands are put on tight or the clamps adjusted. During the processing period, the top is held in place by the band or clamp, which allows the air to escape but holds the top to the jar. When the jar starts to cool after processing, the steam condenses and a partial vacuum is formed within. Greater pressure outside the jar than inside presses the top down firmly and the seal is formed between the top, gasket, and jar. The sealing material hardens as the jar cools, making the seal complete. If the screw band is loose after processing, hold the lid in place so it will not turn, and screw the band tight. Jars of this type must be left to cool in an upright position. When the jars have cooled, remove the screw bands and clamps and save them to use again.

Cool all glass jars in air out of drafts. Special care should be taken to protect jars that have just been taken from a pressure cooker, as the temperature of the food is still above the boiling point, which places the glass under considerable strain. Breakage may occur if a draft strikes the jars. Leaving the jars in the cooker for three or four minutes after it has been opened will reduce the danger of breakage. Use a jar lifter or tongs to remove the jars from the pressure cooker.

Do not cover the jars with cloths or blankets while cooling as this prolongs the cooking of the food and may result in flat-sour spoilage to certain foods. The processing period is adequate to make the food keep and cooling should follow at once. After processing and cooling, all types of glass jars should be inverted and observed for leakage.

Loss of liquid from glass jars during processing. When glass jars are processed in the steam pressure cooker, there is frequently a loss of liquid. While this may occur to some extent with all types of jars, it is generally less with those of the vacuum-sealing type which have a seperate rubber ring or sealing composition in addition to the glass or metal cap and screw band. Mason and lightning-type mason jars are partially sealed before they are put in the cooker, and the seals are completed as soon as they are taken out. Tight sealing of these jars will not prevent the loss of liquid during pressure processing and may cause the

rubbers to push out, thus making a tight seal difficult to obtain. For adjustments of the different types of jars, see preceding material. Steps can be taken to reduce the loss of liquid by properly regulating the pressure cooker.

During water-bath processing, the water should cover the jars at least 1 to 2 inches and should be kept boiling constantly.

Never open the jars after processing to add more liquid.

Removing jar caps. To remove caps from the self- or automatic-sealing jars, puncture the caps to release the vacuum and lift up. For other types of jars, pull out the rubber ring with the fingers or with pliers. If this is difficult, invert the jar in warm water, covering the cap, and allow it to remain for several minutes. This will soften the rubber ring and make it easier to remove.

The types of spoilage bacteria vary with different foods. There are more than one hundred million bacteria in a teaspoonful of fertile soil, any of which could cause food to spoil if they were not washed out or killed by heating. For example, some of the most heat-resisting forms of bacteria are in the soil. Consequently a low-growing vegetable like spinach may get heavily contaminated and the fuzzy coating on string beans may shelter such bacteria and make them difficult to remove. Sanitation is an essential part of canning.

Bacteria may cause the following types of spoilage in canned foods:

Fermentation.—Acid and gas are produced by the action of yeasts and bacteria during fermentation, causing the food to become sour or "cheesy." Tin cans may bulge or seals on glass jars may be broken by the accumulated gas. This is the most common type of spoilage. A well-exhausted can should have both ends flat and tight. Cans with overfill may not have a vacuum and yet not be spoiled.

Flat sour.—The bacteria causing flat-sour spoilage produce acid without gas. They grow best at temperatures about 110°-150° F., and sometimes cause spoilage in canned foods not properly cooled after processing or held at too high storage temperatures. Corn, peas, and string beans are subject to flat-sour spoilage.

Putrefaction.—The growth of putrefactive bacteria in canned food is sometimes marked by gas production or a bad odor, or the softening and darkening of the food. Putrefaction occurs in protein foods which are low in acidity, such as meats, peas, and corn.

Examination of canned food before use. All foods should be inspected before being prepared for the table. Canned food is no exception to this rule. If there is any evidence of spoilage, the food should be discarded and non-acid vegetables and meats should be burned.

Inspect the can or jar before opening. In tin cans both ends should be flat and curved slightly inward. Neither end should bulge or snap back when pressed. All seams should be tight and

clean with no traces of leaks. In glass jars there should be no bulging of the rubber and no signs of leakage.

When the container is opened, there should not be any sudden outburst of air or spurting of liquid. The odor should be characteristic of the product. Any different odor probably indicates spoilage. The inside of tin cans should be smooth and clean or well laquered and not markedly corroded. Food may be left in a tin can after it is opened, provided it is covered and kept cold, just as is done with any other cooked food. Acid foods and tomatoes may dissolve minute quantities of iron from the can and acquire a slightly metallic flavor, but this is harmless. The purple that develops in red fruits and sometimes in peaches and pears canned in tin is merely a change in the color pigments and is harmless.

The broth over canned meats and chicken may or may not be jellied, depending on the quality of connective tissue and cartilage in the meat. If it is liquid, this is no indication of spoilage.

Never taste to discover spoilage. When spoilage has occurred in non-acid foods, there is always a possibility that even taste may cause serious illness, or even death. For this reason it is good practice to boil all canned non-acid vegetables before using them. The processes recommended for meats are much heavier than for vegetables and should destroy all dangerous bacteria.

Proportions of sugar and water for light, medium, and heavy syrups*

Syrup	Sugar to one gallon of water				Degrees Balling or per cent of sugar
	Cups	Quarts	Pounds	Ounces	
Light	5	1¼	2	2	20
Moderately light	8	2	3	10	30
Medium	12½	3⅛	5	9	40
Moderately heavy	19	4¾	8	6	50
Heavy	28	7	12	8	60

*Taken from U. S. D. A. Farmer's Bulletin No. 1762, "Home Canning of Fruits, Vegetables, and Meats."

In making the syrup, add the sugar to the water, and dissolve by warming and stirring. Fill a tall cylinder with the syrup at 60° F., and place the saccharometer in it. The reading is taken at the surface of the liquid. The Balling or Brix saccharometers read directly in terms of percentage of sugar. A heavy syrup may be prepared and diluted with water to yield lighter syrups as required.

Syrups should be boiled, strained and poured over the fruit boiling hot.

Directions for Packing and Processing

Berries—Blackberries, blueberries, dewberries, huckleberries, Logan blackberries, raspberries. Gather berries in shallow vessels so as to prevent crushing, and can them as soon as possible. Wash carefully and remove caps. Sort out smaller and imperfect berries and extract juice from them for making syrup of medium sweetness.

Raspberries and other berries of soft texture keep their shape better for dessert purposes if packed raw, although they tend to rise to the top of the container after processing. Press the raw fruit gently into the containers so they will be well filled, and cover with hot medium syrup. If using tin cans, exhaust for 3 to 5 minutes before sealing.

For use in pies and where the appearance of the whole fruit is not so important, precook the berries and pack hot. To each pound of raw berries add ¼ to ½ pound of sugar, according to the sweetness of the fruit, stir gently, and boil for 3 to 5 minutes. Pack boiling hot. Process as directed in timetable for processing fruits, tomatoes, and other acid foods.

Peaches—To prepare peaches for canning, immerse them in boiling water for about ½ minute or until the skins will slip easily, plunge at once into cold water for a few seconds, remove the skins, cut the peaches into halves and discard the pits.

Use a light or medium syrup as desired. Put in a cracked peach pit for every quart of syrup and strain out before using. Cook prepared peaches in this syrup until cooked or transparent. Do not overcook until soft. Pack, placing halves pit side down in overlapping layers. Watch carefully for air bubbles. Fill containers with hot syrup. Wipe off the rim of the jar with a clean cloth and seal. If rubbers are used as in the Hazel-Atlas or Mason jars, these should be put on the jar before starting the packing of the fruit. The peaches can be processed in boiling water 15 minutes to prevent any possibility of mold or, if desired, they may be precooked, packed hot, and proceed to finish the process.

Peaches may be packed raw, but a better and fuller pack is obtained if the fruit is first simmered in the syrup for 4 to 8 minutes. Do not cook until soft. Pack at once placing the halves pit side down in overlapping layers. Fill the containers with hot syrup. If the peaches are packed cold in tin cans cover with hot syrup and exhaust the cans for 5 minutes before sealing. Process as directed in timetable.

Apricots—Prepare the same as peaches.

Pears—Peel and cut in half and core. Cook in medium syrup about 10 minutes. Pack the pears hot into containers and fill with boiling syrup. Process as directed in timetable (20 minutes). Or, the pears may be cooked until transparent and packed hot in sterilized containers and sealed.

Apples—Pare, core, and cut into desired size. Cook in medium

syrup at a slow temperature until cooked and transparent. Use only apples that will hold their shape. Fill the jars with the hot apples. Cover with boiling syrup, and seal at once. Apples that will not hold their shape can be canned successfully as applesauce.

Plums—Plums are usually canned whole. Gather as they begin to ripen. After washing, prick each plum to prevent skin from bursting. Pack into containers. Cover with hot syrup. Process 20 minutes.

Cherries—Cherries may be canned pitted or unpitted, depending on the way they are to be served. If unpitted they should be pricked to prevent shrinkage. Pack in clean sterilized jars and fill with boiling syrup. Use heavy syrup for sour cherries and medium for sweet cherries. If cherries are pitted, boil in medium syrup for 5 minutes and fill containers boiling hot. Process the time required by timetable. (Cherries may be precooked, packed hot, and processed according to timetable.)

Rhubarb—Select young and tender stalks. Trim and wash carefully. Cut into ½-inch lengths. Cover with hot heavy syrup. Seal and cook in water bath 5 minutes.

Gooseberries—Use method suggested for berries packed raw. Substitute heavy syrup for medium syrup and proceed as for other berries.

Tomatoes—Select firm ripe tomatoes, uniform in size, shape, and color. Be careful to select tomatoes that are not discolored or over-ripe. Put tomatoes into trays or shallow layers in wire baskets. Dip in boiling water until the skin slips. Remove and plunge immediately into cold water. Drain. Core and skin quickly. Pack into jars as closely as possible without crushing. Fill with tomato juice made by the tomatoes that are not suitable for canning whole. Strain the juice to fill the jar of whole tomatoes. Add a teaspoon of salt per quart. Wipe off any juice with clean cloth. Seal and process 45 minutes.

Canning of Low Acid Foods

Vegetable belong in the low or non-acid class. They require processing with a steam pressure cooker at temperatures from 240° to 250° F. 4-H Club members are advised to use only the steam pressure cooker in canning these foods. Idaho is in the botulinus area. Only safe methods in canning should be used and directions should be followed carefully. Drying and brining are suitable methods for saving foods if a steam pressure cooker is not available.

Vegetables

Asparagus—Select fresh tender stalks. Sort according to size and wash thoroughly. Tie in uniform bundles standing upright with tough portion in boiling water. Cover and boil 2 or 3 minutes. Or: Cut the stalks into ½-inch lengths. Add water to cover and boil for 2 minutes in uncovered vessel. Pack boiling hot into containers. Cover with water in which asparagus was

boiled. Add 1 teaspoon of salt to each quart. Process pint glasses 30 minutes, quart glasses 35 minutes, at 10 pounds pressure.

Greens—Pick over the greens, discarding imperfect leaves and tough, fibrous stems. Wash carefully in running water or through a number of waters, lifting the greens out each time. This helps to remove the sand, dirt, etc. Cover the greens with water heated to simmering but not boiling. Cook in uncovered vessel 5 minutes or until greens are wilted. Pack hot into containers, taking care not to make too solid a pack. Have sufficient hot liquid to cover the greens. Add 1 teaspoon salt to each quart. Process immediately for 60 minutes at 15 pounds pressure if pints, or 65 minutes of quarts. Note: Tender young whole beets make excellent greens and an attractive pack.

String Beans—Wash thoroughly. Snap. Leave whole or cut into desired size. Add boiling water to cover and simmer uncovered for 5 minutes or until beans are wilted and will bend without breaking. Pack hot into containers. Cover with hot water. Add one teaspoon salt to each quart. Process 30 minutes at 10 pounds pressure if in pints or 35 minutes if in quarts.

Timetable for Processing Fruits and Tomatoes*

The times given here for processing in the boiling water bath apply only to places with altitudes of 1,000 feet or less. For all altitudes above 1,000 feet, the time should be increased 20 per cent for each additional 1,000 feet.

When half-gallon glass jars are used, add 5 minutes to times given for pint and quart glass jars. Process the container immediately after packing. Cool the food in tin cans in cold water immediately after processing.

Product	Style of pack	Processing period in boiling water 212° F.		Type of tin can
		Pint and quart glass jars	No. 2 and No. 3 tin cans	
		Minutes	Minutes	
Apples	Steam or boil to wilt; pack in hot syrup or water	15	10	Plain tin
	Apple sauce, Pack hot	5	5	Plain tin
Apricots	Precook and pack hot	15	15	Plain tin
	Pack raw; cover with hot syrup	25	No. 2, 15 No. 3, 25	
**Berries:	Precook and pack hot	5	5	Sanitary enamel
Including Gooseberries	Pack raw; cover with hot syrup	20	15	Sanitary enamel
Cherries	Precook and pack hot	5	5	Sanitary enamel
	Pack raw; cover with hot syrup	25	20	Sanitary enamel
Peaches	Precook and pack hot	15	15	Plain tin
	Pack raw; cover with hot syrup	Soft, 25 Firm, 35	Soft, 20 Firm, 30	Plain tin Plain tin
Pears	Precook and pack hot	20	20	Plain tin
	Pack raw; cover with hot syrup		No. 2, 20 No. 3, 25	Plain tin
Plums	Precook and pack hot	5	5	Sanitary enamel
	Pack raw; cover with hot syrup	20	15	Sanitary enamel
Rhubarb	Precook and pack hot	5	5	Sanitary enamel
	Precook and pack hot	5	5	Plain tin (preferred)
	Pack raw	45	35	or sanitary enamel

* Taken from U. S. D. A. Farmers' Bulletin No. 1762, "Home Canning of Fruits, Vegetables, and Meats."

**Includes blackberries, blueberries, dewberries, huckleberries, Logan blackberries, and raspberries.

Timetable for processing non-acid vegetables in the steam pressure canner*

The processes given here apply to places with altitudes of 2,000 feet or less. At altitudes over 2,000 feet, add 1 pound pressure for each additional 2,000 feet. Follow the directions for operation of canner and removal of jars and cans after processing. Cool tin cans in cold water immediately after processing.

Product	Pint Glass Jars		Quart Glass Jars		No. 2 tin cans		No. 3 tin cans		Type of tin can
	240° F., or 10 pounds pressure	250° F., or 15 pounds pressure	240° F., or 10 pounds pressure	250° F., or 15 pounds pressure	240° F., or 10 pounds pressure	250° F., or 15 pounds pressure	240° F., or 10 pounds pressure	250° F., or 15 pounds pressure	
	Minutes	Minutes	Minutes	Minutes	Minutes	Minutes	Minutes	Minutes	
Asparagus	30		35		30				Plain tin
String beans	30		35		25		30		C enamel or plain tin
Beets, Baby	30		35		30		30		Sanitary enamel
Corn:									
Whole-grain	60		70		50		65		C enamel
Cream-style	75		85			70			C enamel
Greens, including spinach		60		65		55		No.2½, 60	Plain tin
Peas:									
Green	45				40				Plain tin
Black-eyed	50		55		40		50		Plain tin or C enamel
Pumpkin		60		75		60		70	Sanitary enamel
Squash		60		75		60		70	Sanitary enamel
Vegetable soup mixtures	60		70		50		65		Plain tin

* Taken from U. S. D. A. Farmers' Bulletin No. 1762, "Home Canning of Fruits, Vegetables, and Meats."

Gauge pressure corresponding to specified process temperatures at various altitudes.*

Temp. Deg. F.	Sea Level	Feet above sea level							Temp. Deg. C.
		500	1000	2000	3000	4000	5000	6000	
225	4.2	4.5	4.7	5.2	5.7	6.2	6.6	7.1	107.2
240	10.3	10.5	10.8	11.3	11.7	12.2	12.7	13.1	115.6
250	15.1	15.4	15.6	16.1	16.6	17.1	17.5	18.0	121.1

*This table is taken from the National Canners Association Bulletin 26-L (Third Ed.) "Processes for Non-Acid Canned Foods in Metal Containers." June 1937.

Score Card*

Canned Fruit and Vegetables

Package—Tightly sealed containers of specified size, clean, neatly labeled, clear glass or tin cans. (If tin cans are used, they should be bright, having slightly concave ends, showing some vacuum. A gauge may be used to determine the vacuum.) 10

Pack 30

Fullness—All space, except proper headspace, should be filled. 10

Uniformity—Pieces of fruit or vegetable should be reasonably uniform in size. (Fancy pack not practical.) 10

Proportion of fruit or vegetable to liquid—The liquid should just cover the product. 10

Product 40

Absence of defects—Original material of good quality and degree of maturity, free from indications of spoilage. 10

Uniformity 10

Color—As nearly that of the original as is possible after cooking. Free from artificial matter.

Consistency—Tender without overcooking.

Flavor—Characteristic of the fruit or vegetable 20

Liquid 20

Clearness—Little or no cloudiness or small particles, free from gas bubbles.

Syrups for fruits—Suitable proportion of sugar.

100

Evidences of Spoilage

Foods canned in tin sometimes show the following evidences of spoilage:

Buckled cans.—Cans that have caved in, or collapsed, on the sides are called buckled cans. This may occur when No. 3 or larger-sized

*From score cards adopted by Bureau of Home Economics, Washington, D. C.

cans are cooled too quickly after processing. These large cans should be allowed to remain in the cooker until the pressure gauge has reached zero to avoid a too sudden change of pressure. Cans of smaller sizes when slack-filled sometimes buckle on cooling and break the seams. In this case the food should be put into other cans and reprocessed, or used at once.

Springers.—Springers are cans with bulged ends. The ends of cans generally become convex, or outwardly curved, during processing because of expansion of the food and the formation of steam. When the cans cool, the ends should snap back to a concave, or inwardly curved, position. If a can is too full, the ends may not snap back into proper position. Such a can is called a springer. Such cans should be marked so they will not be confused with those that become bulged during storage.

Swelled cans.—When gas is formed within a can it may cause the ends to bulge. For example, some fruits, such as prunes, apples, and some berries, react with the metals of the can, and hydrogen gas is liberated. When this collects, the can may become a "hydrogen swell." In this case the food itself is not affected. However, in several types of food spoilage, gases are produced that cause swelled cans. For this reason bulged ends on a can are regarded as an indication of spoilage. When canned fruits show such a condition, they should be examined for other indications of spoilage. When a can of meat or non-acid vegetables has bulged ends, it should be disposed of by burning.

Perforations.—Some of the fruits that react with the metals of the can, producing hydrogen swells, may also cause perforations and leaks. This results from the centering of the chemical reaction on a few points. If the can is discovered soon after leaking starts, the food may be used, but if the leakage is not detected until later, fermentation or other types of spoilage may have set in.

Canned foods are likely to develop perforations and hydrogen swells rather quickly if stored in too warm a place, hence cool storage is especially important for canned fruits that react in this way on the metal.

Frozen Canned Foods

Freezing does not cause canned foods to spoil unless it breaks the seal and permits micro-organisms to enter. All frozen canned foods should, therefore, be examined for leakage. Sometimes freezing may bulge tin cans and spread the seams enough to permit bacteria to enter and yet not cause leakage. Bulged cans of frozen food should be used as promptly as possible if they cannot be kept frozen.

(Much of the above material on the canning of fruits and vegetables has been taken from U. S. D. A. Farmers' Bulletin No. 1762, "*Home Canning of Fruits, Vegetables, and Meats,*" which may be used for further reference.)

Suggestions for Club Meetings

First Meeting—*Organization*

1. Call to order.
2. Election of officers.
3. Explanation of requirements by leader (including record books).
4. Plans for time and place of meetings.
5. Appointment of demonstration team for next meeting.
6. Club pledge.
7. Games (30 minutes).
8. Dismissal.

Second Meeting

1. Call to order.
2. Roll call.
3. Explanation by leader of plans for meeting.
4. Read "Successful Canning" and "Steps in Canning" and time-table for processing fruits.
5. Selection of demonstration team for the next meeting. Select two girls to serve light refreshments (if desired).
6. Demonstration on preparation of cans for canning.
7. Explanation of steam pressure cooker by leader.
8. Instructions by leader for work to be done at following meeting.
9. Song.
10. Club pledge.
11. Dismissal.

Third Meeting

1. Call to order.
2. Roll call.
3. Announcements by leader.
4. Demonstration by selected team on canning of any available fruits in season.
5. Light refreshments served by two girls.
6. Plans for date and location of next meeting.
7. Appointment by leader of demonstration team for next meeting.
8. Report on home work.
9. Club pledge.
10. Dismissal.

Fourth Meeting

1. Call to order.
2. Roll call.
3. Demonstration by leader and selected team to demonstrate any fruit.
4. Review of preparation of jars for use and methods of canning, time table.
5. Games.
6. Plans for following meeting. Discuss and select plans and

place for following meeting. Leader appoint demonstration team.
7. Check on record books.
8. Club pledge.
9. Dismissal.

Fifth Meeting

1. Call to order.
2. Roll call.
3. Review processing of non-acid vegetables.
4. Explanation of the use and operation of the steam pressure cooker.
5. Demonstration—canning of fruit or tomatoes.
6. Appointment of demonstration team for next meeting.
7. Song.
8. Report on home work.
9. Games (as desired).
10. Dismissal.

Sixth Meeting

1. Call to order.
2. Roll call.
3. Demonstration—canning of vegetables.
4. Review points: emphasize importance of using steam pressure cooker in canning vegetables; explain loss of liquid from glass container; discuss types of spoilage, examples: fermentation, flat sour, putrefaction, botulinus; emphasize importance of cooking vegetables after opening the jar.
5. Plans for following meeting by leader; appointment of demonstration team.
6. Song.
7. Club pledge.
8. Games (as desired).
9. Dismissal.

Seventh Meeting

1. Call to order.
2. Roll call.
3. Song.
4. Demonstration of judging fruits and vegetables.
5. Report on home work done by individuals.
6. Check up on record books.
7. Refreshments if desired.
8. Plans for following meeting by leader.
9. Club pledge.
10. Dismissal.

Eighth Meeting

1. Call to order.
2. Roll call.
3. Song.
4. Report of home work done by individual members.

5. Discussion of problems in canning, led by leader.
6. Check on record books.
7. Review points to observe in judging.
8. Emphasize use of steam pressure cooker and caution in using.
9. Plans for picnic (if desired). Appoint committees for:
   a. Selection of place.
   b. Refreshments.
   c. Games.
10. Club pledge.
11. Dismissal.

Ninth Meeting

1. Club picnic.
2. Appointment of demonstration team for next meeting.

Tenth Meeting— *Plans for Achievement Day*

1. Call to order.
2. Roll call.
3. Demonstration given by team on fruits, vegetables, or soups.
4. Discussion of points in demonstration.
5. Emphasize use of steam pressure cooker, steps in canning, danger of spoilage, loss of liquid from jar, examination of canned goods before using, directions for processing.
6. Check record books.
7. Dismissal.

Eleventh Meeting

1. Call to order.
2. Roll call.
3. Practice judging.
4. Report on record books.
5. Report of individual home work.
6. Report of problems in canning by individual members.
7. Club pledge.
8. Dismissal.

Twelfth Meeting

Achievement Day.—Record books are to be turned in for the final completion of the project, and the club may present exhibits of work done or other activities suitable for the achievement day program.